





sustainable facilities VS. Sustainable Facilities

By Kevin Folsom

Being environmentally responsible is a hot topic and critical issue. Many in the scientific community estimate we are slowly destroying the Earth's climate and landscape as we know it today. However, not all scientists agree with this theory, as a significant number of people have been environmentally responsible for a long time, recognizing early that it is simply the right thing to do.

As a result, there are a growing number of sustainable solutions—products, techniques, and services—and many are more affordable too. With so many affordable energy-saving products today, this movement is being called the “fifth fuel” (i.e., energy companies incentivizing customer energy efficiency upgrades with cash to avoid adding generating plants).

I recently heard a presentation from New York City officials, estimating the city will grow by another 1.5 million people in the near future. They are planning to keep their energy usage flat by modifying the building code requirements to enhance energy efficiency and environmentally sustainable, and retrofitting existing facilities to become energy efficient.

So, what do sustainable facilities (from an environmental perspective) mean to educational institutions? This meaning will continue to evolve as we learn more and incorporate new technologies and techniques. Research is reaching a point where we can begin making more accurate *assumptions* about the cause and effect of our short- and long-term actions. This helps us identify major roadblocks that are keeping us from incorporating the latest and greatest environmentally sustainable initiatives.

In my department—as in many others—the primary roadblock is lack of education and financing. I have a pretty antiquated campus from an educational facilities perspective, but my department manages quite well with the resources available to us. Lighting systems are 20+ years old, distributed chiller and boiler systems 20 to 50 years old, roofing 20 to 80 years old, windows 20 to 80 years old, etc.

In recent years, I have had four energy service companies go through my campus looking for energy savings through system upgrades and seeing a payback with the utility and reactive maintenance savings. Unfortunately, not one of these firms can come up with a plan that has less than a 25-year payback. So this leaves me with only two major incentives for my leadership to consider energy efficiency renewal—reliability and better comfort.

Even if all of this work was done, we're still left with outdated space distribution, restrooms, elevators, plumbing systems, electrical systems, and cosmetic issues.

I have been studying several resources on the full-life sustainability of serviceable facilities from birth to burial, which is most common in the educational industry (e.g., *The Facility Audit* by Harvey Kaiser, and *Buildings...*

The Gifts That Keep on Taking by Rod Rose, both published by APPA). There are reliable scientific techniques that have been tried, tested, researched, validated, and proven to preserve a facility for life. The overall method is referred to as planned capital renewal.

There are numerous levels that can be used to go about this, but to start we have to remember our early physics lessons in high school about the Second Law of Thermodynamics¹. Everything we build will decay, but it may last longer if properly maintained.

So here's a puzzling question....If we build facilities that the natural law causes to decay at fairly predictable rates from birth to burial, why do we not plan for it?

There are two approaches for creating TRUE sustainable facility models. You either save your pennies for the day to come, plan to go into debt at those times, or plan your full facility inventory accordingly. As I describe these, keep in mind that I'm lumping all facilities together.

A "50-year facility's design" is used more like 100 years with a 50-year renewal cycle, because educational institutions seldom remove facilities. Nonetheless, there are generally three sub-cycles that have a fairly predictable decay rate, required compliance to maturing codes, and economic phase out needs:

1. At the end of the first 8 to 12 years, components needing renewal are life safety systems, flooring, interior painting, exterior waterproofing, mid-life-cycle roof maintenance, and replacement of premature failing components. Approximate cost is 15 to 20 percent of the Current Replacement Value (CRV) at that point in time.
2. At the end of 25 to 30 years, components needing replacement or possibly renewal due to decay or economic phase out are the HVAC mechanical system, roofing system, exterior openings, exterior waterproofing, interior space layout due to institutional changing needs, and code compliance for ADA, elevators, life safety, and environmental. After this work the facility for the most part will seem new and effective again. Approximate cost is 40 to 50 percent of the CRV at that point in time.
3. At the end of the first 38 to 42 years, components needing renewal are life safety systems, flooring, interior painting, exterior waterproofing, mid-life-cycle roof maintenance, and premature failing components. Approximate cost is 15 to 20 percent of the CRV at that point in time.

At the end of the 50- to 60-year life of the facility, evaluation is made whether to historically restore or remove the facility from the inventory. Consequently, these three sub-cycles are opportunities to incorporate the latest and greatest (affordable) in sustainable supporting products and techniques.

Institutional leadership is not taking into account the renewal needs of their facilities. And, the maintenance operations run on average with about half the funding needed. Meanwhile, as we progress along through the years, we hit a quantum leap in environmental sustainability awareness. Then to everyone's surprise, leadership begins to see that not enough is being done to support this, mostly in their facilities. As a result, we begin

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cramming all this new energy saving technology and techniques into old antiquated facilities needing significant renewal.

What are we going to do about this? Fortunately, the solution has been used by numerous institutions for 30+ years. And the solution is so elementary I've learned that a church used

Figure 1

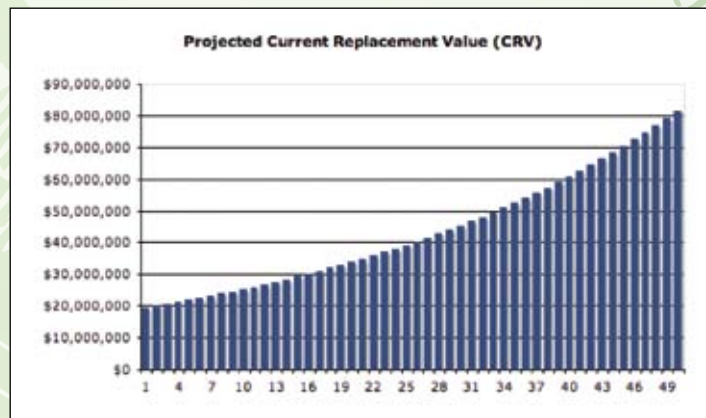
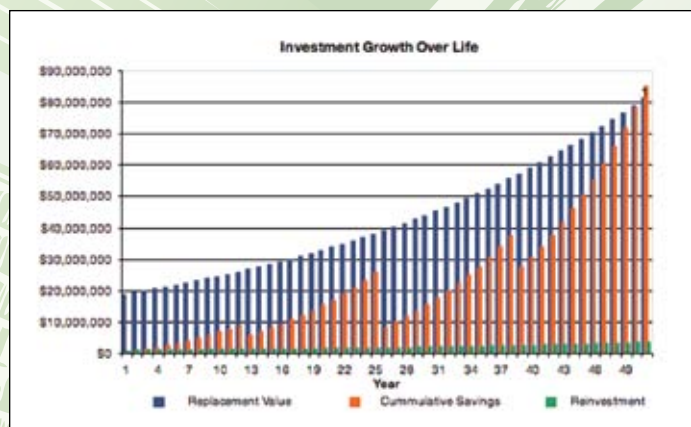


Figure 2



the model before it even became public knowledge. The first solution is saving/reinvesting for planned capital renewal.

Here's how it works. If you maintain the Current Replacement Value² (CRV) of a facility annually, preferably from the time it was constructed, then add 3 percent for inflation to the next year, you have the average next year's CRV. Do this throughout the 50-year life so that it looks something like Figure 1.

This represents the projected CRV annually for the facility's 50-year life cycle (obviously, this will have to be adjusted as years pass to follow the real inflationary trend).

Now we can calculate the estimated annual savings to reinvest throughout the life of the facility for future capital renewal

needs. Not all state institutions can carry funding over annually, or plan on interest income so we'll go about this solution differently, but let's work on the private institutions that are able to do so first. If we plan on 6 percent as our return on our saving's long-term reinvesting, and we want to plan on full renewal at the end of the 50-year life cycle, 2.5 percent of the CRV will need to be set aside annually. Figure 2 shows everything put together.

Notice the dips in the Cumulative Savings graph at years 12, 25, and 38³. Those are where the percentage of funds (listed in the sub-cycles) was used to pay for the incremental renewal needs were addressed—to include the latest sustainable products and techniques of the day.

Finally, where does the institution get the 2.5 percent to make the annual reinvestments? No facility should ever be added to an institution's inventory without being linked to some kind of revenue source. This can be done with retail sales, tenant rent, tuition, or endowment earning interest. Otherwise, the institution's operation budget will carry the burden or debt will be incurred.

Most state institutions are not able to carry funding over from one year to the next or plan on interest income in the out years, so their planning is slightly different. The graph in Figure 2 is the same, but the Cumulative Savings does not represent available cash, rather it represents the rising cost of renewal needs. Earmarking facilities for renewal at the 12, 25, and 38th year sub-cycles is something that can be budgeted and is predictable.

Planned capital renewal of facilities is the most effective method for addressing the rising sustainable needs of facilities, so let's not forget that this is the TRUE Sustainable Facility model. ☞

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NOTES

- 1 The First Law of Thermodynamics says we do not create energy, we simply redirect it into a useful form. The Second Law of Thermodynamics says all matter is held together by energy, and over time that energy naturally returns to its original state unless we physically do something to slow the entropy.
- 2 There are different definitions of CRV, but for the purpose of calculating the FCI and planned capital renewal, this includes the general contractor fee, architectural fee, all related consultants, value of major in-house work, connecting the utilities and IT network to an existing campus centralized utility or city-supplied utility.
- 3 While performing all renewal needs within one year is best to minimize disruption to facility use, sometimes it is not feasible for spread of funding, and scheduling. This usually cannot be predicted many years in advance so adjustments may be made as the time draws near.